Space Weather Forecast

Issued on Thursday, 22 September 2022 at 13:09 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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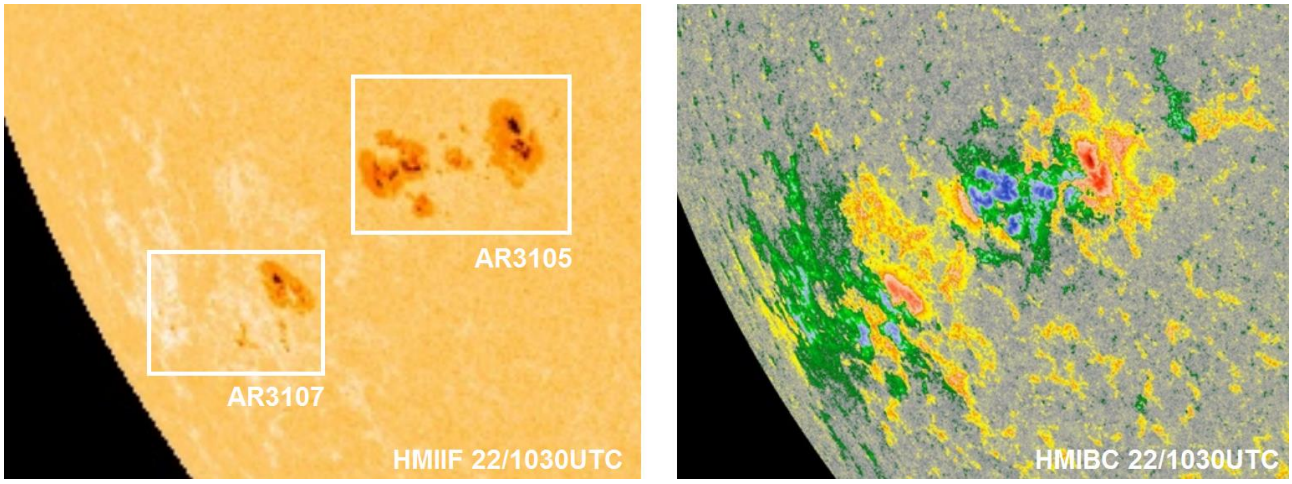
Space Weather Forecast Headline: Chance of R1-R2 Radio Blackouts throughout. G1 Geomagnetic Storm intervals Likely 23 September, Chance G2.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity fell to low over the past 24 hours, with frequent small common-class X-ray flares observed, interspersed by isolated slightly larger magnitude noteworthy flares. The peak of these larger events was observed from the largest an nominally most complex group on the Sun - a middle-ranking common class flare at 22/1134UTC. There were up to five sunspot regions observed at any one time in the period, with a sixth fading early on in the southeast as a new one grew near the meridian.

The largest sunspot group on the Sun was the aforementioned flaring group, which showed minor growth in its intermediate and leading spots, with a slight overall areal increase also seen. To its immediate east was another complex group, which is thought likely to be hiding detail given the poor viewing angle due to its proximity to the eastern solar horizon. This group showed only minor reconfiguration in its small southern spots. Nearer the meridian, a rapidly-developing group grew from nothing near the middle of the Sun, while a more modest increase was seen in a spot group to its south. Finally, a region in the southwest showed gradual decay.

Figure 3: Visible and magnetic imagery of two of the more complex sunspot regions on the current facing side of the Sun. The larger of the two (i.e. the northernmost) was responsible for the peak flare in the 24 hours.



Satellite imagery in the period showed a slow Coronal Mass Ejection (CME) as heading mainly south and east of the Sun-Earth line from around 21/1630UTC, the source of which is speculative, but is perhaps best correlated with one of the large southeast groups. A tentative analysis of this eruption has been conducted, with the result that a glancing blow is perhaps possible later on

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Sunday 25 September. It should be noted that no triangulating imagery was available for this analysis, and further refinement will be carried out if and when this materialises.

Immediately prior to the issuing of this guidance, a faint possible CME signature began to appear on imagery between 12 and 04 o'clock on the Sun's facing side. The source for this is unclear (perhaps even being far-sided), and analysis will be conducted in due course.

Also observed in the 24 hours was a 'filament eruption' (arc of plasma leaving the Sun) from near the northeastern horizon around 22/0200UTC. This is thought to now be appearing heading behind and slightly above the Earth in the track of its orbit to no anticipated effect at Earth.

Solar Wind / Geomagnetic Activity: The solar wind has shown a continuing gradual resumption of a slow regime, with the speed falling from an early high at elevated levels to survive as slightly elevated by the period's end. The number of particles comprising the solar wind and their associated magnetic field were both broadly in their typical range, with the north-south component of the magnetic field generally co-aligned with Earth's field (to lesser geomagnetic effect).

The net result of the above solar wind measures was for mostly quiet geomagnetic activity, provisionally at the very bottom of the measurement scale throughout.

Energetic Particles / Solar Radiation: Solar radiation continued its roughly week-long downward trend to be now very close to typical low Background levels.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is forecast to be low to moderate, with further common-class flares expected and a with an ongoing chance of moderate-class flares. The main flare risk remains from the southeastern quarter of the Sun.

Solar Wind / Geomagnetic Activity: There is tentatively a risk of a glancing blow from a CME later in the UTC day of Sunday 25 September. This feature was seen leaving the southeastern part of the Sun late on 21 September. This feature will be further analysed should imagery become available.

Otherwise, slightly elevated solar winds will gradually ease towards background over the remainder of day one (Thursday 22 September). The next enhancement from the fast wind of a larger coronal hole is then expected day two (Friday 23).

Generally quiet geomagnetic activity is therefore expected until early day two. Activity should then increase to likely G1/Minor Storms, with a chance for G2/Moderate Storm intervals. Conditions should then provisionally ease to quiet by day four, Sunday 25 September, although there is now a tentative slight chance of further G1 intervals should the 21 September CME arrive later in this UTC day. This final aspect is particularly low confidence.

Energetic Particles / Solar Radiation: No solar radiation storms are expected.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	70	30	20
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	40	40	40	40
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	2	2	2	2
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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